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HD Oil is no longer king - and that's fuelling a revamp in some schools

BY Emma Graney

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With oil no longer the undisputed energy king, a growing number of energy engineering students want broader learning opportunities

Mustafa Al-Asadi has been stung by the energy sector before.

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When he graduated from the Southern Alberta Institute of Technology in 2014 with a petroleum engineering technician diploma, he landed a job in the industry right away. But then in 2016, as oil prices continued the freefall that had started 18 months earlier, he was laid off, along with thousands of workers across the sector.

He estimates close to three quarters of those who graduated the year after him never found work, as they emerged from their studies into a rapidly shrinking job market. Many believed it was a routine blip, typical of the cyclical industry, but the expected bounce-back never materialized.

He tried working in construction, but his dream of a career in energy never left him, so he reassessed his options. He discovered that the University of Calgary had started a new energy engineering program in 2015. It would, he found out, allow him to upgrade his polytechnic diploma to an engineering degree. And he would learn about not just oil and gas, but also alternative energy systems and energy policy. He enrolled.

"I thought, 'This is the perfect opportunity for me to move out of fossil fuels and try to adapt to the change happening with energy in general in Canada,'" he said.

Mr. Al-Asadi's story is not unique. There was a time, not long ago, when a degree in oil and gas engineering was a ticket to gainful employment. With oil prices hovering around US\$100 a barrel, graduates could look forward to fat paycheques, and training junkets in places like Houston and Dubai.

But now, with oil no longer the undisputed energy king, a growing number of energy engineering students want broader learning opportunities. At universities throughout North America, young aspirants' interest in traditional petroleum programs is waning. The students who remain are beginning to demand courses on alternative fuels, sustainability and low-carbon options.

And the schools are listening. As the world marches toward a more diversified energy mix, the administrators of oil and gas engineering programs have begun to conclude that diversifying their pedagogy away from fossil fuels is the only way for them to stay relevant.

Universities are overhauling courses and broadening into subjects that, as recently as a decade ago, either didn't exist at all or were considered best suited to specialist electives.

Schools that fail to evolve risk becoming as fossilized as the hydrocarbons they lecture about.

The Petroleum Engineering Department Heads Association tracks the number of bachelors of science in petroleum engineering awarded in the U.S. each year. The highest number the group ever recorded was around 2,600, in 2017. By 2021, it had dropped to just 925.

Recent Canadian numbers are harder to track. According to Universities Canada, the number of undergraduates who completed a bachelor's-or-equivalent program in petroleum engineering in 2016 was around 200, and there were about 100 postgraduates. By 2018, the most recent year for which data are available, those numbers had declined to about 150 undergraduates, and 90 postgrads.

In the heart of Canada's oil and gas country, broader programs like Mr. Al-Asadi's are going strong. But this summer, the University of Calgary cancelled enrolment in its bachelor of science in oil and gas engineering, following a massive decline in student interest. Before the oil crash in 2014 and 2015, enrolment in the decades-old program stood at about 40 students each year. But hardly any signed up last year, and this year only a handful graduated.

"You cannot run a program if there's really nobody in it," said Professor Arin Sen, head of the university's chemical and petroleum engineering department.

Dr. Sen stressed that the decision to nix the program doesn't reflect a lack of support on the university's part for fossil fuel education. He said the plan is to reallocate resources into courses that produce graduates able to glide more smoothly across different facets of the energy sector.

"What we're looking at is not just giving them education in oil and gas engineering, but now adding to it information around these other alternative forms of energy, including hydrogen for example," he said.

Bill Rosehart, dean of the Schulich School of Engineering at the university, said providing students with maximum career flexibility is key.

"They hear us saying, and economists saying, 'We don't even know what the jobs of the future are, because there's so much innovation happening right now,' " he said.

Canada's energy workers reluctant to return to a sector plagued by uncertainty

Federal leaders could do more to link corporate financial disclosure measures to climate action

The shift in postsecondary education reflects a broader change in government policy, aimed at transitioning away from fossil fuels and preparing workers for the adjustment.

Take the Liberal Party, which has promised to create a \$2-billion fund for oil producing provinces to spend on partnering with workers and communities to create jobs. Prior to the election campaign, the Liberal government announced consultations on legislation that would guide programs and funding to support workers and their communities in the transition to a low-carbon economy.

The Conservative Party has said it will support training programs to ensure workers have the skills they need "for the jobs of today and tomorrow," and has promised loans of up to \$10,000 for those who want to upgrade their qualifications.

The NDP has said it will eliminate fossil fuel subsidies and redirect the cash into low-carbon programs to bolster employment in cleaner sectors.

A passion for energy

As a teenager, Mr. Al-Asadi worked as a roughneck on an oil rig in his native Iraq. He watched petroleum engineers in the field make project decisions. And he wanted to follow in their footsteps.

Now he's banking on his University of Calgary studies to help him realize his dream, as companies commit to net-zero goals and some move away from oil and gas.

Oil and gas will remain a key part of the energy mix, he said, but Canada - and the world - must diversify. "We can't really hide anymore. We have to step up and work toward the alternatives."

With the energy sector undergoing a massive shift, Mr. Al-Asadi admits he is worried he may not find a job after he graduates. But with his newly expanded education, his current internship at oil and gas giant TC Energy Corp. and the years of oil experience under his belt, he is hopeful he will be able to drive positive change in the industry.

These days, while he sits in class, Mr. Al-Asadi finds himself thinking back on his work in the oil fields of Canada and Iraq. He mulls ways to improve the huge, sprawling oil sands facilities in Northern Alberta. Could they power their drill shacks with solar energy? Or replace diesel with natural gas?

"There's a lot of opportunities for us to actually switch and make this transitioning smooth," he said. "I hope I can bring something to their plate, and be part of the change."

That wish to be "part of the change" is a sentiment Jennifer Miskimins often encounters from students in her role as head of the Colorado School of Mining's petroleum engineering department.

She said it is imperative to get students thinking about issues such as carbon capture, social responsibility, emissions reduction and sustainability.

Dr. Miskimins compared the drive toward environmental responsibility in university oil and gas programs to an earlier push for increased attention to worksite safety. Preventing worker injuries used to be covered in electives or individual courses, but is now an integral part of every program. In the same way, she said, sustainability needs to be baked into every degree.

"We have not only companies ... that want to see our students trained in this, but we also have students that say, 'Yeah, petroleum engineering is interesting, but I don't want to be part of the problem. I want to be part of the solution.' And we have to help them with that," she said.

Dr. Miskimins acknowledged that now is a challenging time to work in energy education.

She said she is constantly having to defend what she does, and she struggles to figure out what to tell parents of potential students when they ask, "Is my kid going to have a career in this?"

"Those are not 30-second conversations. Those are, let's sit down, let's look at the big picture," she said.

Maximum flexibility

With the energy sector in flux, the University of Calgary isn't the only institution figuring out how to provide broad and flexible qualifications to better lure energy engineering students. Some schools have already been doing so for years.

Professor Richard Chuchla, the director of the energy and earth resources program at the University of Texas at Austin, said that students are still interested in energy, but that there is more uncertainty facing the sector than ever before.

His program, which has been around for 40 years, is already a multidisciplinary energy program. That, he said, has made it attractive to students as the sector diversifies. And he expects to see more programs broaden in a similar manner.

Focusing on an area like petroleum will prepare students for one discipline, he said, "but not for one of the thousands of other potential energy outcomes."

"You can't teach students about just wind, or just solar, or just oil and gas, because the future is clearly going to be combinations of all those different energy sources and more."

For universities, predicting where the energy industry is headed often involves speaking with industry figures about what they want in graduates, and what trends they believe will affect the sector over the coming years.

At the University of Houston, advice comes from a formal energy advisory board of senior industry leaders. Its members are drawn from all facets of the sector: oil and gas, electricity, renewable energy, finance and policy.

About four years ago, the board came to Ramanan Krishnamoorti, the university's chief energy officer, and advised him to prepare for a major transition in the energy sector, as the world turned its focus toward achieving net-zero emissions.

The university decided to institute what it called micro-credentialing programs - short certificate programs that give students or people already working in the sector extra skills to boost their résumés. Unlike full degree programs, the micro-programs can be developed at a rapid clip to respond to market concerns.

The programs range from 15 to 150 hours in length, and cover areas like sustainable energy development and the hydrogen economy. This fall, the university will add micro-credentialing programs in carbon capture and changes in the electricity grid.

Dr. Krishnamoorti said the short programs have drawn a lot of interest, particularly from people who have been displaced from traditional jobs in the industry, but who still love the sector and its healthy paycheques.

"They want to find ways to continue to be relevant," he said.

Canadian postsecondary institutions offer similar programs. Last week, the Alberta government announced a \$5.6-million pilot project that will create dozens of new micro-credential learning opportunities at several universities in the province. The bulk of them will be focused on high-tech industries like machine learning, but solar energy and sustainable energy technology are both priority areas.

On the other side of the country, at the Memorial University of Newfoundland, the oil and gas sector's dip spurred the school to reconsider the format of its engineering programs. Originally, each oil and gas engineering student was required to take six courses on fossil fuels. But now the school uses a streaming system that allows students to mix petroleum-related coursework with other topics.

"They can have some flavour of oil and gas, but they don't have to limit it to oil and gas," explained Faisal Khan, the associate dean of graduate studies at the university's engineering and applied science faculty.

Unlike most other Canadian universities, MUN places an emphasis on the offshore industry. It has already developed a back-up plan to expand its programs into offshore wind and marine energy, should demand dictate.

Dr. Khan expects that shift to happen in the next five to six years.

"It's happening in the United States as we speak ... and it's just a matter of time that we will start to be in the same position," he said.

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